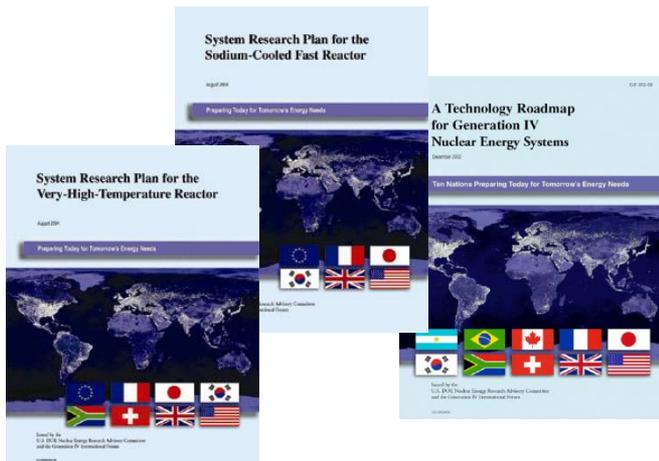




International Collaborations: Generation IV International Forum (GIF)



- **GIF Framework Agreement:** Treaty-level agreement of the governments
 - For research and development collaborations
 - Assigns responsible ministries, departments and agencies
 - Affords protection of intellectual property and sharing of rights
 - Specifies '*steering committees*' for systems to manage the work, and '*projects*' under the steering committee to do the work
 - Supports the creation of '*multilateral R&D contracts*' that can attract industry, universities and other countries into the collaborations



Jul '01	GIF Charter		
Feb 05	GIF Framework Agreement	Planned contributions	
Feb 06	System Arrangements	<u>US</u>	<u>Total</u>
Nov 06	<ul style="list-style-type: none"> ■ Sodium-cooled Fast Reactor (SFR) ■ Very High Temperature Reactor (VHTR) 	74 M\$	268 M\$
		58 M\$	255 M\$
2007	Project Arrangements		
	<ul style="list-style-type: none"> ■ SFR Advanced Fuel ■ SFR Safety and Operation ■ SFR Component Design and BOP ■ SFR Global Actinide Cycle International Demonstration 	43 M\$	132 M\$
		2 M\$	33 M\$
		4 M\$	17 M\$
		25 M\$	86 M\$
Feb 08	<ul style="list-style-type: none"> ■ VHTR Fuel and Fuel Cycle 	13 M\$	92 M\$
Mar 08	<ul style="list-style-type: none"> ■ VHTR Hydrogen Production 	17 M\$	37 M\$
June 09	<ul style="list-style-type: none"> ■ SFR Safety and Operation 	1.4 M\$	16.34 M\$
Sept 09	<ul style="list-style-type: none"> ■ VHTR Materials 	28 M\$	126 M\$



Other International Collaborations

■ Work For Others

- Graphite qualification with PBMR Pty Ltd, South Africa (ORNL)*
- Graphite irradiation with Japan (Toyo Tanso and Tokai Carbon, at ORNL)

■ Cooperative Research and Development Agreements

- CRADA with PBMR Pty Ltd for AGR-2 fuel irradiation in ATR (INL)*
- CRADA with CEA for AGR-2 fuel irradiation in ATR (INL)
- Potential CRADA with PBMR Pty for Graphite Creep and Composite Material Qualification (ORNL, under discussion)*

■ Bilateral Agreements

- Collaboration with Japan (JAEA) for HTTR test data (INL, under development)
- Graphite irradiation with Japan (JAEA on behalf of Toyo Tansa, at ORNL, under development)
- I-NERI:
 - Korea on VHTR Air Ingress and Core Bypass (INL), on Advanced Computational Methods and SCO₂ Energy Conversion (ANL)
 - France on Metallic (INL) and Composite (ORNL) Materials
 - Japan on use of ZrC in TRISO fuel
 - Euratom (Italy on LFR (ANL, LLNL))
- Congressionally-directed collaborations with Russia on gas reactors (in cooperation with NNSA)

■ International Organizations – IAEA, NEA/OCD

*Impact of PBMR Pty Ltd downsizing being evaluated.



GIF Very High Temperature Reactor (VHTR) System

- **VHTR activities integrated into Next Generation Nuclear Plant**
- **Participants: Canada, China, Euratom, France, Korea, Japan, Switzerland and United States (South Africa continuing with observer status)**
- **US Steering Committee member Carl Sink**
- **Project Arrangements include:**
 - Fuels and Fuel Cycle (2008)
 - Materials - graphites, high-temperature metals, ceramics (chaired by U.S.) (2010)
 - Hydrogen Production (2008)
 - Computational Methods, Validation and Benchmarking (chaired by U.S.) (2011)
- **GIF VHTR activities integrated with national programs**
 - China – High Temperature Reactor – Pebble Bed Modular (HTR-PM)
 - Euratom – RAPHAEL, PUMA and EUROPAIRS Projects
 - Japan – High Temperature Test Reactor (HTTR)
 - US – Next Generation Nuclear Plant (NGNP)
 - South Africa – Pebble Bed Modular Reactor Demonstration Power Plant





Regulatory Gap Analysis

- **Comprehensive review to identify “gaps” between existing LWR-focused regulations and those needed to license HTGRs**

- **Gap analysis is in progress and will provide regulatory accounting of existing NRC requirements and guidance documents applicable to HTGRs**
 - Enable early resolution of identified gaps
 - Identified gaps and resolutions will be tracked to completion
 - Completed resolutions are then incorporated into the COLA Content Guide for HTGRs

Interactions Related to SMR Licensing

- **NGNP project also involved with SMR community on generic advanced reactor licensing topics**
 - NRC documented key SMR policy, licensing, and technical challenges in its SECY 10-0034 (March, 2010)
 - NGNP is identified in the SECY as the “test case” for addressing and resolving many of the identified issues
 - NGNP has made a number of submittals and is in active dialogue with the NRC in addressing the highest priority SECY items
 - NGNP participates in the NEI Licensing Task Force to provide input on generic topics (annual fees, insurance liabilities, etc.)



Licensing Path Forward

- **Keep NRC resources engaged with disposition of NNGNP priority topics, including common understanding of technology issues**
- **Continue R&D collaborations with NRC**
- **Conduct Generic Site Hazards Assessments**
- **Complete Regulatory Gap Analysis that will serve as basis for creation of a license application form and content guide**
- **Begin development of COLA Content Guide**
- **Continue to support HTGR workshops and industry advanced reactor forums addressing licensing topics**
- **Implement NRC approved Appendix B Quality Assurance Program**
- **Preliminary design detail is needed to address Content Guide open items and develop license application documents**



Nuclear Energy Advisory Committee (NEAC) Review

- **EPA Act 2005 requires a review of NGNP Project by the NEAC prior to proceeding to final design and licensing (Phase 2)**
- **Evaluate Conceptual Design deliverables, R&D results achieved to date, status of NRC licensing activities, impacts on greenhouse gas emissions and business models**
- **Reviews:**
 - Market Case / Design Requirements - September 30/October 1
 - Licensing / Program Plan/ Partnership - November 15/16
 - Pebble and Prismatic Designs - February 22/23
 - R&D - April
- **Recommendation Report expected in May 2011**

NGNP Path Forward

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- **Continue Research and Development in materials, fuels, code validation experiments and end user interface analysis**
 - **Continue licensing efforts with the Nuclear Regulatory Commission**
 - **Complete NEAC Review**
 - **Establish Cost-shared Public-Private Partnership**
 - **Timing of Secretarial Decision influenced by NEAC Recommendation and status of Cost-shared Public-Private Partnership**